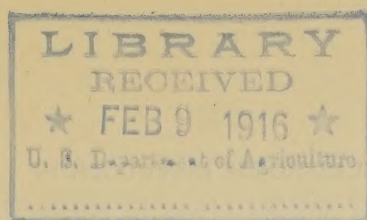


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SQUAB RAISING AS A SUBJECT OF INSTRUCTION IN SECONDARY SCHOOLS.

INTRODUCTION.

Wherever the vocational aim is considered in teaching agriculture, the educational value of a subject will increase with the amount of practical work in which the student may participate. Poultry husbandry is being given a prominent place in the teaching of vocational agriculture, because it affords an opportunity for practice for a large number of students. The interest of adolescent students will be greatly increased if a subject is known to have economic value, especially if they may participate in the profits. There are few students who may not keep some kind of poultry on their own account. While the keeping of common fowls is the most popular of poultry projects there are some sections where squab raising is equally as profitable if undertaken in the right way. In the vicinity of large cities which will afford a good market and where students may have little land the raising of squabs should prove both popular and profitable.

RELATION OF SUBJECT TO COURSE OF STUDY.

Relation to animal husbandry.—Squab raising will come naturally as a part of the general course in animal husbandry or a special course in poultry. Where the majority of the class may be interested in the subject pigeons may serve well as a means of teaching many of the principles underlying the care, feeding, and breeding of animals. In most schools there will be a relatively small number of the class that may carry out a squab-raising project. These students may apply the general principles of animal husbandry which they have studied to the raising of squabs.

Correlation with zoology.—Wherever zoology is taught as a subject separate from animal husbandry there should be close correlation of the two subjects. In a number of schools where the inductive method is used in the teaching of zoology the pigeon is used as a type with which to begin the study of birds. A study of the structure, physiology, and habits of the pigeon in zoology fits very well with a study of methods of care and management in agriculture.

CLASSROOM INSTRUCTION.

Use of reference material.—The outline given in connection with the home project will suggest topics for discussion arranged in logical sequence. Most of the questions may be answered from a study of United States Department of Agriculture, Farmers' Bulletin 684, Squab Raising. This bulletin should be placed in the hands of the students. The teacher and other students who desire to go into the subject more extensively will find several periodicals devoted to the subject.

Use of illustrative material.—In a study of types and breeds, it is well to use the living bird as far as possible along with good illustrations. Cages or small coops may be used in bringing the birds into the classroom or a field trip may be planned to visit local breeders. Such trips may be made for the purpose of studying equipment and methods as well as the birds. Each trip should have a definite aim and each student should be required to make a detailed report.

PRACTICUMS.

Judging.—In connection with a study of types and breeds students may be given practice in judging the birds from the standpoint of squab breeders. If suitable score cards are not available the students may plan a score card under the direction of the teacher. Students who wish to get further training along this line should take advantage of the poultry shows when squab-breeding pigeons are being judged. A poultry show in connection with home projects will not only aid in arousing interest, but also will afford an opportunity for practice in judging.

Dressing.—If a sufficient number of the class are interested in the production of squabs on a commercial basis, practice should be given in killing, picking, and packing of squabs as a class practicum. If but a few students are interested in this or the following exercises, the work may be assigned as home practicums.

Making of feed hoppers, nest boxes, etc.—If mechanic arts is taught as a separate subject, these exercises may properly be made a part of that work, but it should be done in cooperation with the instruction in animal husbandry. Hoppers, troughs, drinking fountains, and nests which may be purchased of dealers will suggest equipment which the students may make.

THE HOME PROJECT.

In order to make the home project of greatest educational value there must be close cooperation between parents and teacher in the supervision of the project. Inasmuch as the chief aim of the student in the production project is securing a profit, accurate records of time spent, costs, and receipts should be kept. The teacher should not lose sight of the educational aim of the project and should require a written report which will contain methods as well as financial records. To make the project of the highest educational value there must be a close relation between the practical work at home and the work of the school. The following study outline should prove of value in assisting the student to plan his project and to correlate his work and study. It may also be used by the teacher as an outline in class work.

PIGEON PROJECT STUDY OUTLINE.

SQUAB RAISING—A PRODUCTION PROJECT.

- I. Shall I raise squabs as my project?
 1. Do I like pigeons?
 2. Have I a good place to keep pigeons?
 3. Will I be able to give them the constant care which may be demanded?
 4. Is there an opportunity to develop a profitable market for squabs?
 5. Can I secure the consent and cooperation of my parents in this project?
 6. How may I secure the funds necessary to make a start?
- II. What shall be my aim in keeping pigeons?
 1. Shall I confine myself to raising squabs for market?
 2. Shall I work toward developing a flock for breeding purposes?
 3. What additional problems will the production of breeding birds present?

- III. What breed shall I select?
 1. What are the distinguishing characteristics of the leading squab breeds?
 2. In what ways are these breeds superior to the common pigeon?
 3. Is one color superior to another in squab breeders?
 4. What breed and variety will suit my purpose best?
- IV. How shall I get a start?
 1. How many breeders shall I buy?
 2. Shall I buy young stock or tested breeders?
 3. What are the essential characteristics of good breeding stock?
 4. How much should such stock cost per pair?
 5. Do I know of a reliable breeder of whom I can secure the stock I desire at a reasonable price?
- V. Can I build a suitable house and yard?
 1. What are the prime essentials in a pigeon house?
 2. Can I make over any building or portion of a building as suitable quarters for my pigeons?
 3. What are the factors to be considered in selecting a site for a pigeon house?
 4. Can I plan a house suitable to my needs and build it?
- VI. What other equipment will be needed?
 1. What kind of nests shall I provide?
 2. What is the best nest material to use?
 3. How shall I provide for a supply of water?
 4. Shall I use feed hoppers and troughs?
 5. Must I buy this equipment or can I make it? Which will be cheaper?
- VII. Do I understand the hatching and rearing of squabs?
 1. Do I understand the mating and nesting habits of pigeons?
 2. How are the young reared?
 3. Can I distinguish male and female?
 4. What are the most common causes of poor hatches?
 5. What may interfere with the proper rearing of the squabs?
- VIII. How shall I feed my pigeons for the best results.
 1. Do I understand the general principles underlying the feeding of animals?
 2. What are the special food requirements of pigeons?
 3. How shall clear drinking water be provided?
 4. What other materials are needed in connection with food and water?
 5. In what manner shall feed and accessories be given?
 6. In providing a ration have I considered the relative cost of feeds?
 7. Where can I secure good feed and other supplies at the lowest cost?
- IX. How shall I manage my pigeons so as to prevent disease?
 1. Why is cleanliness an important factor in the prevention of disease?
 2. What relation exists between prevention of disease and good feeding?
 3. How may a poorly built house be responsible for ill health?
 4. What parasites are apt to trouble pigeons?
 5. How may these parasites be controlled?
 6. What cheap disinfectants may I use, and how shall I use them?
 7. Do I know the symptoms, cause, and treatment of such common diseases as canker and going light?
 8. What may be the cause of squabs dying in the nest?
 9. How may the number of dead squabs be reduced?
- X. How can I market my squabs to advantage?
 1. At what age are squabs marketed?
 2. How can I tell when they are ready to market?
 3. How are squabs killed and dressed?
 4. How are squabs packed for shipment?
 5. What facts are considered in grading squabs?
 6. Can I develop a private trade in the local market?
 7. What price should I secure at different seasons?
 8. What profit should such prices give me?
 9. How may I know exactly how much my squabs are costing?
 10. Have I provided for accurate detailed records of my work?

BEEKEEPING AS A SUBJECT OF INSTRUCTION IN SECONDARY SCHOOLS.

INTRODUCTION.

Beekeeping should be given some place in agricultural instruction because bees are of importance in the agriculture of nearly every section of the United States. Where honey production is not of commercial importance, bees should be considered in their relation to the pollination of plants. In connection with and even apart from their agricultural value bees have a high educational value. Boys and girls with facilities which may limit them in carrying out most agricultural projects may keep one or more colonies of bees on their own account and through them develop independence and resourcefulness. A study of bees involves many of the general principles of biology with special application to one of the most interesting groups of animals. The perfect communism and the great industry of the inhabitants of the hive should have moral suggestion well worth the time spent in study.

RELATION OF SUBJECT TO COURSE OF STUDY.

All students who live in the country should know how honey is produced and the activities of the hive in a general way. In a general course in agriculture two or three lessons may well be devoted to bees for the purpose of imparting information and arousing interest. As there is such an abundance of illustrative material there is little excuse, even in a general course, for not studying the bees as well as that which is written about them in books and bulletins.

In an extended course in secondary agriculture, with a vocational aim, more time should be given bees in sections where beekeeping is an important industry. This subject may be considered as a phase of animal husbandry unless a special course is given in economic entomology, when it may be made a part of that course. It is not likely that sufficient time will be available for a special course in beekeeping in very many secondary schools, although those students who are going into the business of honey production need the equivalent of a special course in the subject. This problem may be solved by allowing those students to select honey production as a home project and to pursue a more extended study of the subject in connection with their projects. A week may be devoted to the subject with the class as a whole, the time being divided between the classroom and work outside. This work may come at the end of the course in animal husbandry, early summer being a time when hive activities are at their height.

CORRELATION WITH OTHER SUBJECTS.

Where entomology is taught as a separate subject or as a phase of zoology there should be close correlation of the consideration given bees in such a course and beekeeping as a phase of agriculture. The position of bees in the animal kingdom and their life history may be considered by the class in zoology, leaving more time for a consideration of practical honey production in the agriculture class. If all students are not in both classes, the teacher of agriculture may assign special reports on the entomological phases of the subject to be given by students in zoology. Likewise the teacher of zoology may have students of agriculture who may be in his class report upon topics pertaining to the keeping of bees. There may be reciprocal correlations also between beekeeping and botany or horticulture in respect to the relation of bees to plant pollination, and with home economics in relation to the value and use of honey as food.

CLASSROOM INSTRUCTION.

Farmers' Bulletin 447, Bees, may furnish a basis for classroom discussion. This bulletin goes into the subject as deeply as is consistent with the time available. A copy of the bulletin should be secured for each member of the class. Special assignments may be made to other

bulletins and books. The outline given in connection with the home project will suggest topics for discussion arranged in a logical sequence. A knowledge of the bee and the activities of the hive should be made a foundation for their care and management in honey production. It should be needless to add that the teacher should go more extensively into a study of the subject than the students. The list of bulletins given should be helpful in connection with good reference books.

USE OF ILLUSTRATIVE MATERIAL.

A field trip.—One may study about bees in books and bulletins but the best place to study bees is in the hive and out of doors. A field trip by the class to an apiary may be well worth while if it is properly planned and supervised. The trip may be made for the purpose of studying equipment and methods as well as the bees in the hive. If the teacher has not had experience in handling bees in the frames, some other person should take charge of the demonstration. It is likely that the owner of the bees will be helpful in aiding the students to handle them without fear which may be the chief aim of such a visit. Each student should make a written report of the trip.

Assignments may be made to individual students to make certain observations or tests and report to the class. The following questions may suggest others which should be assigned:

1. Do bees visit different species of plants upon one trip?
2. What are the chief honey producing plants of the district and how may the honey produced from the different plants be distinguished?
3. What plants supply the most pollen? How is it gathered?
4. What is propolis? What is its chief source in the district? How is it used by the bees?
5. Are there any colonies of wild bees in the district? How do they differ from those kept in hives?

Use of observation beehive.—An observation hive in operation in laboratory or classroom is always a center of interest and a source of knowledge concerning the activities of bees. Such hives may be purchased from dealers in bee supplies or the students may make an observation hive from an ordinary hive.¹ Bees are kept by a number of schools out of doors under ordinary apiary conditions. Bees kept in this manner afford opportunity for practice as well as observation.

Mounted specimens, charts, etc.—Along with a study of the living bees mounted specimens are useful for a more detailed examination. Models of enlarged specimens and charts showing internal structure are useful if the teacher desires to go into a study of the anatomy of the insect. Samples of hives and other equipment may be brought into the classroom when that phase of the subject is being discussed.

PRACTICUMS.

Handling bees.—Students who are taking up beekeeping as a project should be given as much practice as possible in handling bees. If bees are not kept at the school or on the farms of the students interested, it is possible that arrangements may be made with neighboring farmers for practice in such work as hiving a swarm, transferring, uniting, and feeding.

Making equipment.—If the school is equipped with a shop the class may spend time profitably in such work as making hives and honey cases, folding sections and fastening foundation in sections and frames. This work may be given in connection with the course in mechanic arts where such a course is given apart from the course in agriculture. Where the school lacks equipment for this work it may be assigned as individual home practicums to those who intend to keep bees.

¹ See How to Make an Observation Hive. Univ. Cal. Col. Agr. Circ. 63 (1911).

A HOME PROJECT.

In sections adapted to the profitable production of honey, the keeping of bees will become a suitable minor home project. It is not likely to be selected by all members of the class, neither is it a suitable project in which to apply the general principles of animal husbandry such as may be done with a poultry project or one in pork production. There may be students, however, who desire to work into beekeeping on an extensive scale, or who may wish to keep a few bees in connection with other phases of farming. If the keeping of bees is made a definite project in connection with the course at school and is given close supervision by the teacher of agriculture, it should have high educational value. It should develop skill in handling many tools, an accurate knowledge of an important group of animals, and business ability. The supervision of the project will involve close cooperation between the home and the school. The student should be required to make an accurate record of all that he does in connection with the management of the bees as well as of all costs and receipts and should make a detailed report as a part of his school work. The home project may be made a required part of the course in agriculture or special credit may be given for it on a basis of the amount and quality of the work done. The following study outline should be helpful to students in planning their work as well as furnishing a guide to a study of the subject. There are a number of well-written books which may be used with the bulletins as references.

BEEKEEPING PROJECT STUDY OUTLINE.

HONEY PRODUCTION—A PRODUCTION PROJECT.

- I. Do I understand bees and their behavior?
 1. What position does the honeybee occupy in the animal kingdom?
 2. What is its value to agriculture?
 3. Of what does the colony of bees consist?
 4. How can I distinguish the worker bee from other insects?
 5. How can I distinguish the queen and drones from the workers?
 6. When and how does mating take place?
 7. What is the result of mating?
 8. Describe the secretion of wax and the making of comb and honey.
 9. Describe the life history of the worker bee?
 10. How are queens produced?
 11. Under what conditions are drones produced?
 12. Why can entire new blood be introduced with a new queen?
- II. Shall I keep bees as my project?
 1. Is this section adapted to profitable honey production?
 2. What crops and wild plants will furnish a supply of nectar?
 3. Do I like to work with bees?
 4. Can I arrange to take hold of one or more swarms on my own account?
 5. Will beekeeping fit in well with my other projects and work?
 6. Is there a suitable location for an apiary upon our farm?
- III. How shall I equip my apiary?
 1. With how many stands shall I start?
 2. What kind of hives shall I use?
 3. What kind of bees shall I buy?
 4. Can I buy the kind of bees I want in the kind of hives I desire?
 5. At what time of the year may I best make a start?
 6. What equipment will I need in addition to bees and hives?
 7. Have I the use of a place suitable as a workshop for making hives, etc?
 8. Have I secured the catalogue of a reliable dealer in bee supplies?

IV. Do I understand the manipulation of bees?

1. What is the advantage of the modern hive over the ordinary box hive?
2. What fundamentals of bee behavior should be kept in mind in handling bees?
3. When may bees be handled most safely?
4. What precautions should be made in regard to clothing and protection from stings?
5. How is the smoker used?
6. What is the best method of handling frames full of comb honey and bees?
7. What is the nature and treatment of a bee sting?
8. Can I recognize the various kinds of comb as well as the classes of bees?

V. Can I give my bees the modern management essential to success?

1. Upon what principle is comb foundation used?
2. Why is it economical to use foundation?
3. Can I fit foundation properly into frames?
4. Can I hive a swarm properly?
5. What conditions lead to swarming?
6. How may swarming be prevented?
7. What are the best methods of artificial swarming?
8. How may common bees be improved?
9. How may a new queen be introduced?
10. How may swarms be divided?
11. How may swarms be united?
12. How are swarms transferred from an old box hive to a modern one?
13. What special care may be needed in this section during the winter?
14. What special care and attention may be needed in spring?
15. What is the best method of protection against changes in temperature?
16. What is the most economical and efficient method of feeding bees?
17. What common diseases may infect my bees?
18. How may foul brood be spread?
19. How is foul brood controlled?
20. What other enemies of bees may prove pests?
21. How may robbing be prevented?

VI. Can I produce comb honey of good quality?

1. Why is good comb honey comparatively expensive?
2. Will the market pay sufficiently more for comb honey than for extracted honey to make its production profitable?
3. What conditions are essential to the production of good comb honey?
4. Is this section adapted to the production of good comb honey?
5. What form and size of sections shall I use?
6. How much foundation comb shall I use in each section?
7. Can I fold sections and fasten foundation with skill?
8. Why should care be taken in fitting the sections and separators?
9. When should supers be placed upon the hives?
10. How may the bees be encouraged to store honey in the super?
11. What manipulation of the supers will aid in using the workers to the best advantage during the honey flow?
12. How long should the supers be left on the hive?
13. When is the best time to remove supers?
14. Why should supers fit tight upon the hives?
15. What precautions should be made in removing supers which may incline to stick tight?
16. How are the bees removed from the supers?
17. What preparation is given the sections before they are cased for the market?
18. How is comb honey graded for the market?
19. What kind of honey cases shall I use?
20. Can I use paper cartons to advantage?

VII. Shall I attempt to produce extracted honey?

1. Do I intend to work into honey production on an extensive scale?
2. Will it pay me to buy an extractor at this time?
3. What kind of supers and frames shall I use?
4. Do I understand how to handle the frames and extract the honey?
5. When is the honey ready for extracting?
6. What use may be made of the cappings?
7. Shall I aim toward a special brand of extracted honey?
8. In what form shall I can it?
9. What is the cause of granulated honey?
10. What is the best method for melting it?

PUBLICATIONS OF THE DEPARTMENT OF AGRICULTURE ON BEEKEEPING.

PUBLICATIONS FOR USE OF STUDENTS.

The Treatment of Bee Diseases. Farmers' Bul. 442 (1911).
 Bees. Farmers' Bul. 447 (1911).
 Comb Honey. Farmers' Bul. 503 (1912).
 Honey and Its Uses in the Home. Farmers' Bul. 653 (1915).
 Outdoor Wintering of Bees. Farmers' Bul. 695 (1915).

PUBLICATIONS FOR USE OF TEACHERS.

[The publications in this list are no longer available for *free distribution by the U. S. Department of Agriculture*. They can, however, be found in many libraries and some of them can be purchased of the Superintendent of Documents, Government Printing Office, Washington, D. C.]

The Rearing of Queen Bees. Bur. Ent. Bul. 55 (1905).
 Report of the Meeting of Inspectors of Apiaries, San Antonio, Tex., Nov. 12, 1906. Bur. Ent. Bul. 70 (1906).
 The Bacteria of the Apiary with Special Reference to Bee Diseases. Bur. Ent. Bul. 14, Tech. Ser. (1906).
 The Cause of American Foul Brood. Bur. Ent. Circ. 94 (1907).
 Production and Care of Extracted Honey. Bur. Ent. Bul. 75, pt. 1 (1907).
 Wax Moths and American Foul Brood. Bur. Ent. Bul. 75, pt. 2 (1907).
 Bee Diseases in Massachusetts. Bur. Ent. Bul. 75, pt. 3 (1908).
 The Relation of the Etiology (cause) of Bee Diseases to the Treatment. Bur. Ent. Bul. 75, pt. 4 (1908).
 A Brief Survey of Hawaiian Beekeeping. Bur. Ent. Bul. 75, pt. 5 (1909).
 The Status of Apiculture in the United States. Bur. Ent. Bul. 75, pt. 6 (1909).
 Beekeeping in Massachusetts. Bur. Ent. Bul. 75, pt. 7 (1909). (Bulletin 75 has been published also in complete form with contents and index.)
 Anatomy of the Honey Bee. Bur. Ent. Bul. 18, Tech. Ser. (1910).
 Occurrence of Bee Diseases in United States, Preliminary Report. Bur. Ent. Circ. 138 (1911).
 Behavior of the Honey Bee in Pollen Collecting. Bur. Ent. Bul. 121 (1912).
 Historical Notes on Causes of Bee Diseases. Bur. Ent. Bul. 98 (1912).
 Manipulation of Wax Scales of Honey Bee. Bur. Ent. Circ. 161 (1912).
 Sacbrood, a Disease of Bees. Bur. Ent. Circ. 169 (1913).
 Destruction of Germs of Infectious Bee Diseases by Heating. U. S. Dept. Agr. Bul. 92 (1914).
 The Temperature of the Honey Bee Cluster in Winter. U. S. Dept. Agr. Bul. 93 (1914).
 The Temperature of the Bee Colony. U. S. Dept. Agr. Bul. 96 (1914).